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Patent
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INVESTOR IN PEOPLE

Marconi Communications Limited
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Waterhouse Lane
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Essex
CM1 2QX

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HAB	HAS
26 JUL 1999	

The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP9 1RH

Examiner: 01633 814754
*E-mail: richard.howe@patent.gov.uk
Switchboard: 01633 814000
Fax: 01633 814444

Your Reference: P/61815
Application No: GB 9913990.9

22 July 1999

Dear Sirs

Patents Act 1977:
Combined Search and Examination Report under Sections 17 and 18(3)

Latest date for reply:

18 June 2001

I enclose two copies of my search and examination report and a copy of the citations.

By the above date you should either file amendments to meet the objections in the report or make observations on them. If you do not, the application may be refused.

Publication

I estimate that, provided you have met all formal requirements, preparations for publication of your application will be completed soon after **14 November 2000**. You will then receive a letter informing you of completion and telling you the publication number and date of publication.

Amendment/withdrawal

If you wish to file amended claims for inclusion with the published application, or to withdraw the application to prevent publication, you must do so before the preparations for publication are completed. **No reminder will be issued.** If you write to the Office less than 3 weeks before the above completion date, please mark your letter prominently: **"URGENT - PUBLICATION IMMINENT"**.

*Use of E-mail: Please note that under patent law e-mail may be used to file correspondence only.

An Executive Agency of the Department of Trade and Industry



Application No: GB 9913990.9

Page 2

22 July 1999

Yours faithfully

Richard Howe
Examiner

Important information about combined search and examination

I also ask that you take note of the following points. These might have a bearing on the future stages of your application because the examination report has been sent to you before your application has been published.

- (a) You may file voluntary amendments before making a full response to my examination report. We will publish with your application any new or amended claims you file voluntarily or as a full response, provided that they are received before preparations for publication are completed. It would help us when you file amendments before publication if you could **prominently indicate** in a covering letter whether or not the amendments are intended as a full response to the examination report.
- (b) If you file a full response to the examination report before your application is published I will consider it as soon as possible. However, if this would disrupt the publication of your application, I would have to delay taking any action until the application had been published. This delay could be up to 3 months, depending upon when we receive your response.
- (c) There is another situation when there might be a delay between you filing a full response and the Patent Office responding to it. This would arise if you met all my objections but your application had not or had only recently been published. I could not report the outcome of my re-examination until I was satisfied that the search was complete for documents published before the priority date of your invention and that anybody interested in the application has had three months following publication of the application to make observations on the patentability of your invention.
- (d) Provided that the requirements of the Act have been met, I can send your application to grant as early as three months after publication. Before doing so I will bring the original search up to date and raise with you any further objection that might result from this top-up search. However, there is a possibility that at that time I may not have access to all the patent applications published after the priority date of your invention and of possible relevance to your application. If this is the case I would have to complete the search after grant and if necessary raise any new found novelty objection then.

Application No: GB 9913990.9
Claims searched: 1-7

Examiner: Richard Howe
Date of search: 21 July 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.Q): H4K (KTW, KTS, KSA)

Int CI (Ed.6): H04Q (3/58, 3/60, 11/04)

Other: Online : wpi; epodoc; japio

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	EP 0 660 569 A1 (IBM) - see whole document	1-3,5-6
X	EP 0 224 229 A2 (AT&T) - see whole document	1-3,5-6
X	US 5 423 003 (Geonet) - see whole document	1-3,5-6
X	US 5 291 477 (Bell) - see whole document	1-3,5-6
X	US 5 056 085 (Harris) - see whole document	1-3,5-6

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family

A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P/61815/GPTU73	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 00/ 02237	International filing date (day/month/year) 08/06/2000	(Earliest) Priority Date (day/month/year) 17/06/1999
Applicant MARCONI COMMUNICATIONS LIMITED		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

4

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

Int. Appl. No.

PCT/GB 00/02237

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04Q3/00 H04L12/56 H04Q3/68 H04L12/437

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04Q H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, IBM-TDB, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 851 693 A (LUCENT TECHNOLOGIES INC ;AT & T CORP (US)) 1 July 1998 (1998-07-01) abstract column 1, line 43 -column 3, line 48 claims 1-3 figures 2,5	1-5
A	US 4 853 927 A (WENZEL ROBERT) 1 August 1989 (1989-08-01) abstract figures 3,4 claim 1 column 2, line 57 -column 3, line 36 column 4, line 28-46 -/-	1-5

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- *B* document member of the same patent family

Date of the actual completion of the international search

30 October 2000

Date of mailing of the international search report

07/11/2000

Name and mailing address of the ISA
European Patent Office, P.B. 5818 Patentaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040. Tx. 31 651 epo nl
Fax: (+31-70) 340-3018

Authorized officer

Cichra, M

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 00/02237

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 5 535 195 A (LEE WHAY C) 9 July 1996 (1996-07-09) abstract figures 2,3,5,9,14 claims 1,4,6 column 2, line 40-3 -column 3, line 13 column 5, line 50 -column 6, line 19</p>	1-5
A	<p>WO 98 31159 A (AT & T CORP) 16 July 1998 (1998-07-16) abstract figures 7,8 claims 1,2,13,14 page 6, line 26 -page 7, line 25</p>	1-5

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int'l. Application No

PCT/GB 00/02237

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0851693	A	01-07-1998	US 5999614 A	07-12-1999
			US 5995612 A	30-11-1999
			CA 2218263 A	23-06-1998
			DE 69700493 D	14-10-1999
			DE 69700493 T	13-04-2000
			JP 10210160 A	07-08-1998
US 4853927	A	01-08-1989	DE 3642141 A	16-06-1988
			EP 0271169 A	15-06-1988
			JP 63199545 A	18-08-1988
US 5535195	A	09-07-1996	AU 691260 B	14-05-1998
			AU 1842695 A	29-11-1995
			EP 0711483 A	15-05-1996
			WO 9531058 A	16-11-1995
WO 9831159	A	16-07-1998	EP 0997043 A	03-05-2000

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No. _____

International Filing Date _____

Name of receiving Office and "PCT International Application" _____

Applicant's or agent's file reference
(if desired) (12 characters maximum)

P/61815/GPTU73

Box No. I TITLE OF INVENTION
MESH NETWORKS

Box No. II APPLICANT

Name and address: (Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

Marconi Communications Limited,
New Century Park,
P.O. Box 53,
Coventry,
CV3 1HJ, (GB)

☐ This person is also inventor.

Telephone No.

+44 (0) 2476 562000

Facsimile No.

+44 (0) 2476 562247

Teleprinter No.

State (that is, country) of nationality:

GB

State (that is, country) of residence:

GB

This person is applicant
for the purposes of:

☐ all designated
States

☒ all designated States except
the United States of America

☐ the United States
of America only

☐ the States indicated in
the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

CHOPPING Geoffrey,
"Tregarth",
Furze Hill,
Wimborne,
Dorset, BH21 4HD, (GB)

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only (If this check-box
is marked, do not fill in below.)

State (that is, country) of nationality:

GB

State (that is, country) of residence:

GB

This person is applicant
for the purposes of:

☐ all designated
States

☐ all designated States except
the United States of America

☒ the United States
of America only

☐ the States indicated in
the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf
of the applicant(s) before the competent International Authorities as:

☒ agent

☐ common representative

Name and address: (Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country.)

BRANFIELD Henry Anthony,
Marconi Intellectual Property,
Waterhouse Lane,
Chelmsford,
Essex, CM1 2QX, (GB)

Telephone No.

+44 (0) 1245 275454

Facsimile No.

+44 (0) 1245 275114

Teleprinter No.

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

MADDERN Thomas Slade,
38 Cutlers Place,
Colehill,
Wimborne,
Dorset, BH21 2HU, (GB)

This person is:

- ☐ applicant only
☒ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

GB

State (that is, country) of residence:

GB

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):


Regional Patent

- ☒ AP **ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ EA **Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP **European Patent:** AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ OA **OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|--|--|
| <input checked="" type="checkbox"/> AE United Arab Emirates | <input checked="" type="checkbox"/> LR Liberia |
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LS Lesotho |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> LT Lithuania |
| <input checked="" type="checkbox"/> AT Austria | <input checked="" type="checkbox"/> LU Luxembourg |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> MA Morocco |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> BG Bulgaria | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BR Brazil | |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> MX Mexico |
| <input checked="" type="checkbox"/> CN China | <input checked="" type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> CR Costa Rica | <input checked="" type="checkbox"/> NZ New Zealand |
| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> CZ Czech Republic | <input checked="" type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> DE Germany | <input checked="" type="checkbox"/> RO Romania |
| <input checked="" type="checkbox"/> DK Denmark | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> DM Dominica | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> EE Estonia | <input checked="" type="checkbox"/> SE Sweden |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> FI Finland | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> SK Slovakia |
| <input checked="" type="checkbox"/> GD Grenada | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TM Turkmenistan |
| <input checked="" type="checkbox"/> GM Gambia | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> HR Croatia | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
| <input checked="" type="checkbox"/> HU Hungary | <input checked="" type="checkbox"/> TZ United Republic of Tanzania |
| <input checked="" type="checkbox"/> ID Indonesia | <input checked="" type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> IL Israel | <input checked="" type="checkbox"/> UG Uganda |
| <input checked="" type="checkbox"/> IN India | <input checked="" type="checkbox"/> US United States of America |
| <input checked="" type="checkbox"/> IS Iceland | |
| <input checked="" type="checkbox"/> JP Japan | <input checked="" type="checkbox"/> UZ Uzbekistan |
| <input checked="" type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> VN Viet Nam |
| <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> YU Yugoslavia |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | <input checked="" type="checkbox"/> ZA South Africa |
| | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> KR Republic of Korea | Check-boxes reserved for designating States which have become party to the PCT after issuance of this sheet: |
| <input checked="" type="checkbox"/> KZ Kazakhstan | <input checked="" type="checkbox"/> AG = Antigua & Barbuda |
| <input checked="" type="checkbox"/> LC Saint Lucia | <input checked="" type="checkbox"/> DZ = Mozambique |
| <input checked="" type="checkbox"/> LK Sri Lanka | <input checked="" type="checkbox"/> MZ = Mozambique |

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: regional Office	international application: receiving Office
item (1) 17 June 1999 (17.06.99)	9913990.9	United Kingdom		
item (2) 2 June 2000 (02.06.2000)	0013323.1	United Kingdom		
item (3)				
<input checked="" type="checkbox"/> The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s). items 1 & 2				
<p>* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.</p>				
Box No. VII INTERNATIONAL SEARCHING AUTHORITY				
Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):		Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority): Date (day/month/year) Number Country (or regional Office)		
ISA /				
Box No. VIII CHECK LIST; LANGUAGE OF FILING				
This international application contains the following number of sheets: request : 4 description (excluding sequence listing part) : 3 claims : 1 abstract : 1 drawings : 6 sequence listing part of description : Total number of sheets : 15		This international application is accompanied by the item(s) marked below: 1. <input checked="" type="checkbox"/> fee calculation sheet 2. <input type="checkbox"/> separate signed power of attorney 3. <input checked="" type="checkbox"/> copy of general power of attorney; reference number, if any: 4. <input type="checkbox"/> statement explaining lack of signature 5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): 6. <input type="checkbox"/> translation of international application into (language): 7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material 8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form 9. <input type="checkbox"/> other (specify):		
Figure of the drawings which should accompany the abstract: 4		Language of filing of the international application: English		
Box No. IX SIGNATURE OF APPLICANT OR AGENT				
Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).				
 BRANFIELD Henry Anthony				
For receiving Office use only				
1. Date of actual receipt of the purported international application:		2. Drawings:		
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		<input type="checkbox"/> received:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		<input type="checkbox"/> not received:		
5. International Searching Authority (if two or more are competent): ISA /		6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.		
For International Bureau use only				
Date of receipt of the record copy by the International Bureau:				

This sheet is not part of and does not count as a sheet of the international application.

PCT

FEE CALCULATION SHEET

Annex to the Request

For receiving Office use only

International application No.

Date stamp of the receiving Office

Applicant's or agent's
file reference

P/61815/GPTU73

Applicant

Marconi Communications Limited

CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE 55.00 T

2. SEARCH FEE 605.00 S

International search to be carried out by

(If two or more International Searching Authorities are competent in relation to the international application, indicate the name of the Authority which is chosen to carry out the international search.)

3. INTERNATIONAL FEE

Basic Fee

The international application contains 15 sheets.

first 30 sheets 264.00 b1

remaining sheets x additional amount b2

Add amounts entered at b1 and b2 and enter total at B 264.00 B

Designation Fees

The international application contains designations.

8 x 56.00 = 448.00 D

number of designation fees payable (maximum 8) amount of designation fee

Add amounts entered at B and D and enter total at I 712.00 I

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5. TOTAL FEES PAYABLE 1,416.00

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PATENT COOPERATION TREATY

PCT

NOTIFICATION CONCERNING SUBMISSION OR TRANSMITTAL OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

BRANFIELD, Henry, Anthony
Marconi Intellectual Property
Waterhouse Lane
Chelmsford
Essex CM1 2QX
ROYAUME-UNI

Henry	PL
17. AUG 2000	

Date of mailing (day/month/year) 09 August 2000 (09.08.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference P/61815/GPTU73	
International application No. PCT/GB00/02237	
International publication date (day/month/year) Not yet published	
Applicant MARCONI COMMUNICATIONS LIMITED et al	International filing date (day/month/year) 08 June 2000 (08.06.00) Priority date (day/month/year) 17 June 1999 (17.06.99)

- The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
- This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
- An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
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<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
02 June 2000 (02.06.00)	0013323.1	GB	25 July 2000 (25.07.00)

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer R. Raissi Telephone No. (41-22) 338.83.38
--	--

PATENT COOPERATION TREATY

WO 00/79806
PCT/GB00/02.

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

BRANFIELD, Henry, Anthony
Marconi Intellectual Property
Waterhouse Lane
Chelmsford
Essex CM1 2QX
ROYAUME-UNI

FOREIGNS	22
HAN	
5 JAN 2001	

Date of mailing (day/month/year) 28 December 2000 (28.12.00)		
Applicant's or agent's file reference P/61815/GPTU73		
IMPORTANT NOTICE		
International application No. PCT/GB00/02237	International filing date (day/month/year) 08 June 2000 (08.06.00)	Priority date (day/month/year) 17 June 1999 (17.06.99)
Applicant MARCONI COMMUNICATIONS LIMITED et al		

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
AG,AU,DZ,KP,KR,MZ,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,
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The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
28 December 2000 (28.12.00) under No. WO 00/79806

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

Continuation of Form PCT/IB/308

**NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF
THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES**

Date of mailing (day/month/year) 28 December 2000 (28.12.00)	IMPORTANT NOTICE
Applicant's or agent's file reference P/61815/GPTU73	International application No. PCT/GB00/02237
<p>The applicant is hereby notified that, at the time of establishment of this Notice, the time limit under Rule 46.1 for making amendments under Article 19 has not yet expired and the International Bureau had received neither such amendments nor a declaration that the applicant does not wish to make amendments.</p>	

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WUTTISITTIKULKIJ L ET AL: "USE OF SPARE WAVELENGTHS FOR TRAFFIC RESTORATION IN MULTI- WAVELENGTH TRANSPORT NETWORK" 1996 IEEE INTERNATIONAL CONFERENCE ON COMMUNICATIONS (ICC) , vol. VOL. 3, 23 - 27 June 1996, pages 1778-1782, XP000625112 Dallas (US)	14-16, 18,22,25
A	see the whole document ---	19-21,23
X	EP 0 494 513 A (AMERICAN TELEPHONE AND TELEGRAPH COMPANY) 15 July 1992 see column 4, line 2 - line 7 ---	14,15
X	NAGATSU N ET AL: "OPTICAL PATH CROSS-CONNECT SYSTEM SCALE EVALUATION USING PATH ACCOMMODATION DESIGN FOR RESTRICTED WAVELENGTH MULTIPLEXING" IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS, vol. 14, no. 5, 1 June 1996, pages 893-901, XP000590720 see paragraph III ---	14-16, 18,22,25
X,P.	WO 97 24900 A (MCI COMMUNICATIONS CORPORATION) 10 July 1997 see page 14, line 15 - line 18 see page 15, line 6 - line 18 see page 17, line 6 - page 19, line 21 ---	14-16, 18-22
A	CHAO C W: "FASTAR-A ROBUST SYSTEM FOR FAST DS3 RESTORATION" IEEE GLOBAL TELECOMMUNICATIONS CONFERENCE - PAPER 39.1, vol. 2, 2 - 5 December 1991, pages 1396-1400, XP000332880 Phoenix (US) see the whole document ---	10,11, 23,24, 31,32
A,P	WO 97 01233 A (MCI COMMUNICATIONS CORPORATION) 9 January 1997 see the whole document -----	1,14,26

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/00058

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04Q3/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	COAN B A ET AL: "USING DISTRIBUTED TOPOLOGY UPDATE AND PREPLANNED CONFIGURATIONS TO ACHIEVE TRUNK NETWORK SURVIVABILITY" IEEE TRANSACTIONS ON RELIABILITY, vol. 40, no. 4, 1 October 1991, pages 404-416, XP000232099	1-14, 16-24, 26-32
A	see paragraph 5.2 see paragraph 5.3 see paragraph 6.2 --- -/--	15, 25

☒ Further documents are listed in the continuation of box C.

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

Date of the actual completion of the international search

11 August 1998

Date of mailing of the international search report

18/08/1998

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Authorized officer

De Muyt, H

INTERNATIONAL SEARCH REPORT

In ternational Application No

PCT/US 98/00058

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 494513 A	15-07-1992	US 5182744 A	26-01-1993
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		KR 9607668 B	08-06-1996
WO 9724900 A	10-07-1997	NONE	
WO 9701233 A	09-01-1997	US 5646936 A	08-07-1997

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
28 December 2000 (28.12.2000)

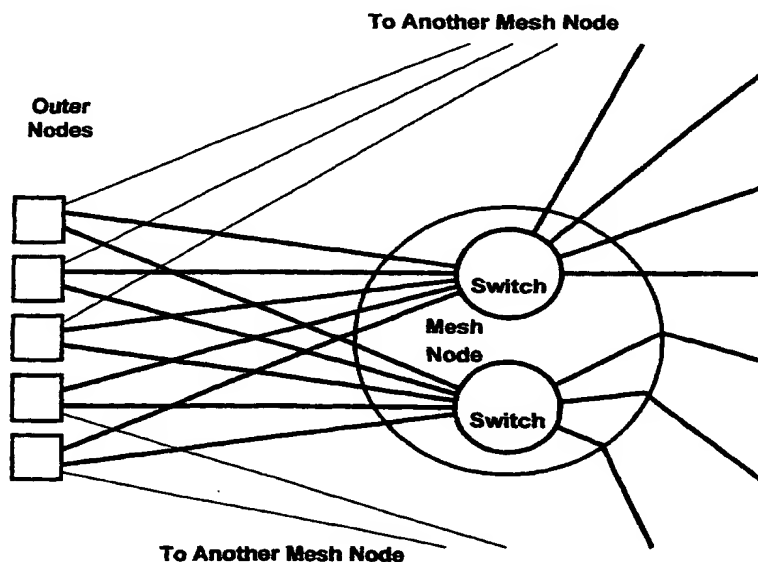
PCT

(10) International Publication Number
WO 00/79806 A1

- (51) International Patent Classification⁷: **H04Q 3/00**, (74) Agent: **BRANFIELD, Henry, Anthony**; Marconi Intellectual Property, Waterhouse Lane, Chelmsford, Essex CM1 2QX (GB).
H04L 12/56, H04Q 3/68, H04L 12/437
- (21) International Application Number: **PCT/GB00/02237**
- (22) International Filing Date: **8 June 2000 (08.06.2000)**
- (25) Filing Language: **English**
- (26) Publication Language: **English**
- (30) Priority Data:
9913990.9 17 June 1999 (17.06.1999) GB
0013323.1 2 June 2000 (02.06.2000) GB
- (71) Applicant (for all designated States except US): **MARCONI COMMUNICATIONS LIMITED** [GB/GB]; New Century Park, P.O. Box 53, Coventry CV3 1HJ (GB).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **CHOPPING, Geofrey** [GB/GB]; "Tregarth", Furze Hill, Wimborne, Dorset BH21 4HD (GB). **MADDERN, Thomas, Slade** [GB/GB]; 38 Cutlers Place, Colehill, Wimborne, Dorset BH21 2HU (GB).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:
— With international search report.
— Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.

[Continued on next page]

(54) Title: **MESH NETWORKS**



(57) Abstract: A telecommunications network having a plurality of mesh nodes, where each mesh node includes one or more switches, and at least one of the mesh nodes includes a plurality of switches, each mesh node having a connection to each other mesh node and each mesh node having associated with it a respective plurality of local nodes, each switch of each mesh node being connected to all of the respective associated plurality of local nodes. The network may be upgraded by adding a further switch to a mesh node and connecting all the respective local nodes to that switch and sharing the connections between the switches of the mesh node. A suitable network routing algorithm controls the routing in the network.

WO 00/79806 A1



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

MESH NETWORKS

In networks, such as telecommunication networks, fully meshed networks are often used to interconnect the nodes together and in particular to interconnect trunk exchanges. Although fully meshed networks can be of considerable use, they do have the characteristic that the more nodes there are in a fully meshed network, then the narrower the routes between nodes have to be once the switches are port limited. Doubling the nodes in a fully meshed network can halve the size of each route across the mesh. However, reducing the route size can increase the chance of blocking as well as reducing the Erlang efficiency.

In some telecommunication networks each fully meshed trunk exchange is also connected to several local exchanges, so that the longer distance trunk calls tend to traverse four exchanges namely a local, a trunk, a second trunk and a final local.

In such a network the local exchanges only need to know if a call originating on its own exchange cannot be terminated on its own exchange, in which case the call is forwarded to a trunk exchange.

For reasons of redundancy a local exchange is normally connected to more than one trunk exchange, in which case a call which cannot be terminated on its own exchange can probably be forwarded to any of the connected trunk exchanges.

However if the local exchanges are connected to more trunk exchanges than are needed for redundancy reasons, then the local exchange could be asked to perform part of the overall trunk routing algorithm. Consequently the intended final destination of the call can be used to decide to which trunk exchange the call should be sent to by the local exchange.

Provided the local exchange is able to route to more than one trunk exchange depending on the destination of the call, then it is possible to use a pair of trunk exchanges to perform the function of one existing trunk exchange, with approximately twice the capacity and throughput. This is assuming that the two exchanges each have the same or similar capacity to the existing trunk exchange. The existing trunk exchange can be one of the pair of trunk exchanges. The pair of trunk exchanges can be known as Siamese trunk exchanges.

According to the present invention there is provided a telecommunications network comprising a plurality of mesh nodes, each mesh node including one or more switches, at least one of the mesh nodes including a plurality of switches, each mesh node having a connection to each other mesh node by means of a connection between a switch at the one mesh node and a switch at the other mesh node and each mesh node having associated therewith a respective plurality of local nodes, each switch of each mesh node being connected to all of the respective associated plurality of local nodes and including a network routing algorithm to control the routing in the network

There is further provided a method of upgrading a telecommunications network, said telecommunications network comprising a plurality of mesh nodes, wherein each mesh node includes at least one switch, each mesh node having a direct connection to each other mesh

node by means of a connection between a switch at the one mesh node and a switch at the other mesh node and the switch or switches of each mesh node being each connected to all of a respective plurality of multiple local nodes, the method comprising the steps of :-

- (a) adding a further switch to at least one of the mesh nodes;
 - (b) connecting all of the respective plurality of local nodes to the further switch;
 - (c) providing a network routing algorithm to control the routing in the network;
- and
- (d) dividing the connections from the at least one mesh node to the switches of the other mesh nodes between the switch or switches and the further switch of the at least one mesh node.

The present invention will now be described by way of example, with reference to the accompanying drawings in which:

Figure 1 shows an example of a network having a number of fully meshed mesh nodes;

Figure 2 shows an example of a fully meshed mesh node of the network shown in Figure 1 connected to multiple local nodes;

Figure 3 shows an example of a fully meshed mesh node of the network shown in Figure 1 with a single switch;

Figure 4 shows an example of a fully meshed mesh node of the network shown in Figure 1 with two unconnected switches;

Figure 5 shows an example of a fully meshed mesh node of the network shown in Figure 1 with two connected (Siamese) switches; and

Figure 6 shows an example of a network as shown in Figure 1 including a number of fully meshed mesh nodes where each node has two switches.

Figure 1 shows an example of a network having fully meshed mesh nodes, such as trunk exchanges, where each mesh node is directly connected to every other mesh node. In practice these links are often carried by transmission systems.

In Figure 2 some of the mesh nodes (trunk exchanges) of Figure 1 are shown connected to multiple local nodes, such as local exchanges. In practice these connections are often carried by transmission systems. The connection of multiple local exchanges to trunk exchanges is a recognised telecommunication network configuration.

Figure 3 shows a mesh node of Figure 2 containing a single switch. Such a switch could be a trunk exchange equipment. This switch is connected to all the other mesh Nodes as well as all the illustrated multiple Local Nodes. The illustrated Local Nodes may also be connected to switches at other mesh nodes.

Figure 4 shows the mesh node of Figure 3, to which has been added a further switch. Any added switches could be trunk exchanges. The direct links from the other mesh nodes are taken to one or the other, but not both, of the switches. The pair of switches are both connected to all the multiple local nodes associated with that mesh node. The local nodes have to be able to route calls or messages to the appropriate one of the pair of switches.

Figure 5 shows the mesh node containing two switches as in Figure 4, but with a connection (Siamese link) between them. If the connection between an local node and the switch that is normally used to route a call or message is congested, then if the connection to the other one

of the pair of switches is not congested then this connection and the Siamese link can be used in series, to avoid the congestion. The Siamese link is not essential, but can be a useful feature for practical networks.

Figure 6 shows an example of a network where all the Mesh Nodes each have two switches, each pair of switches within a mesh node being joined by a Siamese link. The overall result is that each switch is connected to approximately one half of the other mesh nodes and approximately one quarter of the other switches. For larger examples the approximations can be more precise, but there is no basic need to equally divide the routes between the mesh nodes and the switches. Some routes may naturally carry more traffic and some pairs of switches may not have identical characteristics to each other.

The network will require a network routing algorithm to control the routing of messages, of whatever form through the network.

CLAIMS

1. A telecommunications network comprising a plurality of mesh nodes, each mesh node including one or more switches, at least one of the mesh nodes including a plurality of switches, each mesh node having a connection to each other mesh node by means of a connection between a switch at the one mesh node and a switch at the other mesh node and each mesh node having associated therewith a respective plurality of local nodes, each switch of each mesh node being connected to all of the respective associated plurality of local nodes and the network including a network routing algorithm to control the routing in the network.
2. A telecommunications network as claimed in Claim 1, wherein one or more local nodes are connected to more than one mesh node.
3. A telecommunications network as claimed in Claim 1 or 2, wherein the plurality of switches of a mesh node are connected.
4. A method of upgrading a telecommunications network, said telecommunications network comprising a plurality of mesh nodes, wherein each mesh node includes at least one switch, each mesh node having a direct connection to each other mesh node by means of a connection between a switch at the one mesh node and a switch at the other mesh node and the switch or switches of each mesh node being each connected to all of a respective plurality of multiple local nodes, the method comprising the steps of :-
 - (a) adding a further switch to at least one of the mesh nodes;
 - (b) connecting all of the respective plurality of local nodes to the further switch or switches;
 - (c) providing a network routing algorithm to control the routing in the network; and
 - (d) dividing the connections from the at least one mesh node to the switches of the other mesh nodes between the switch or switches and the further switch of the at least one mesh node.
5. A method of upgrading a telecommunications network as claimed in Claim 4, further including the step of making a connection between the switches of the at least one mesh node.

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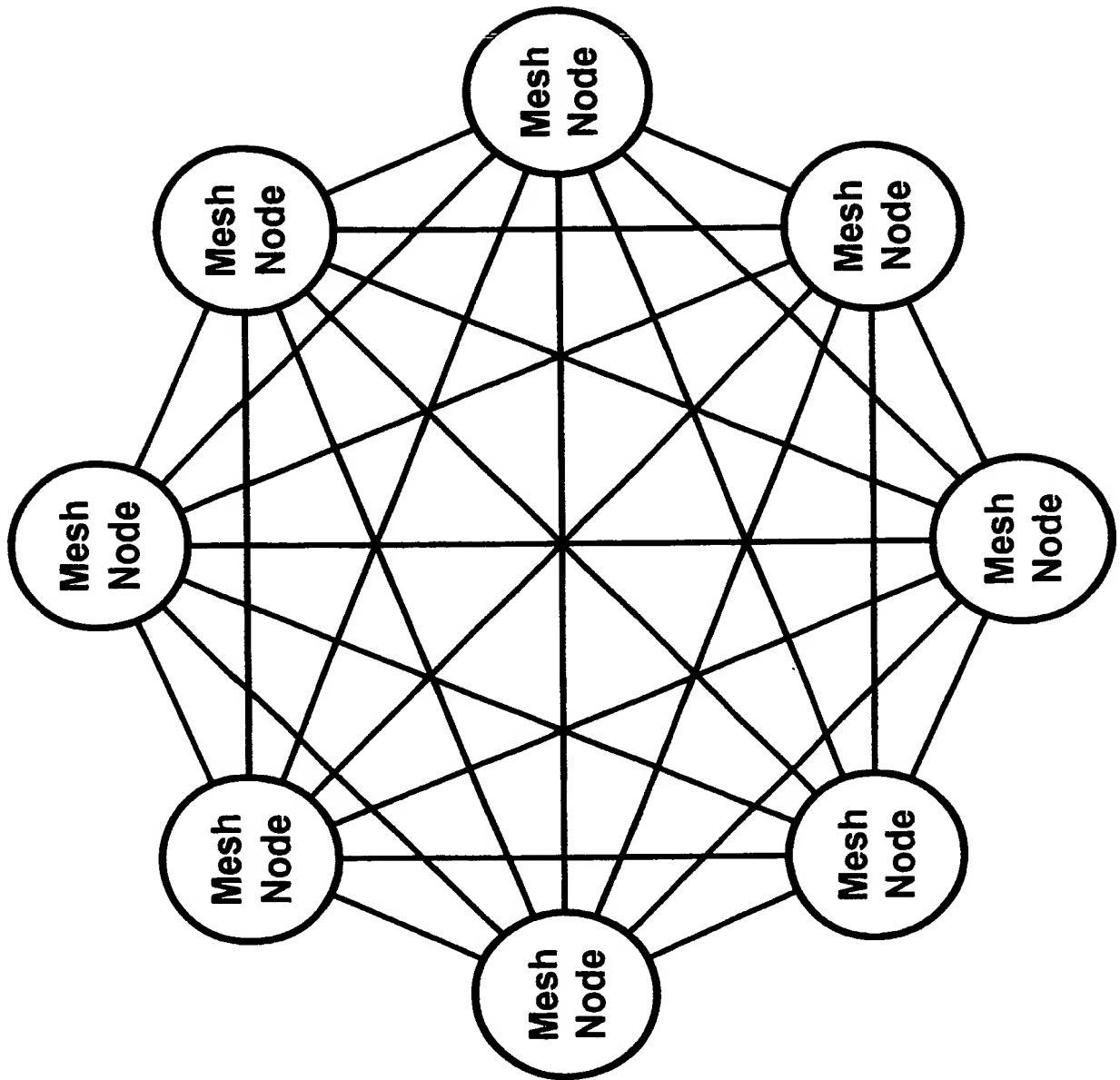
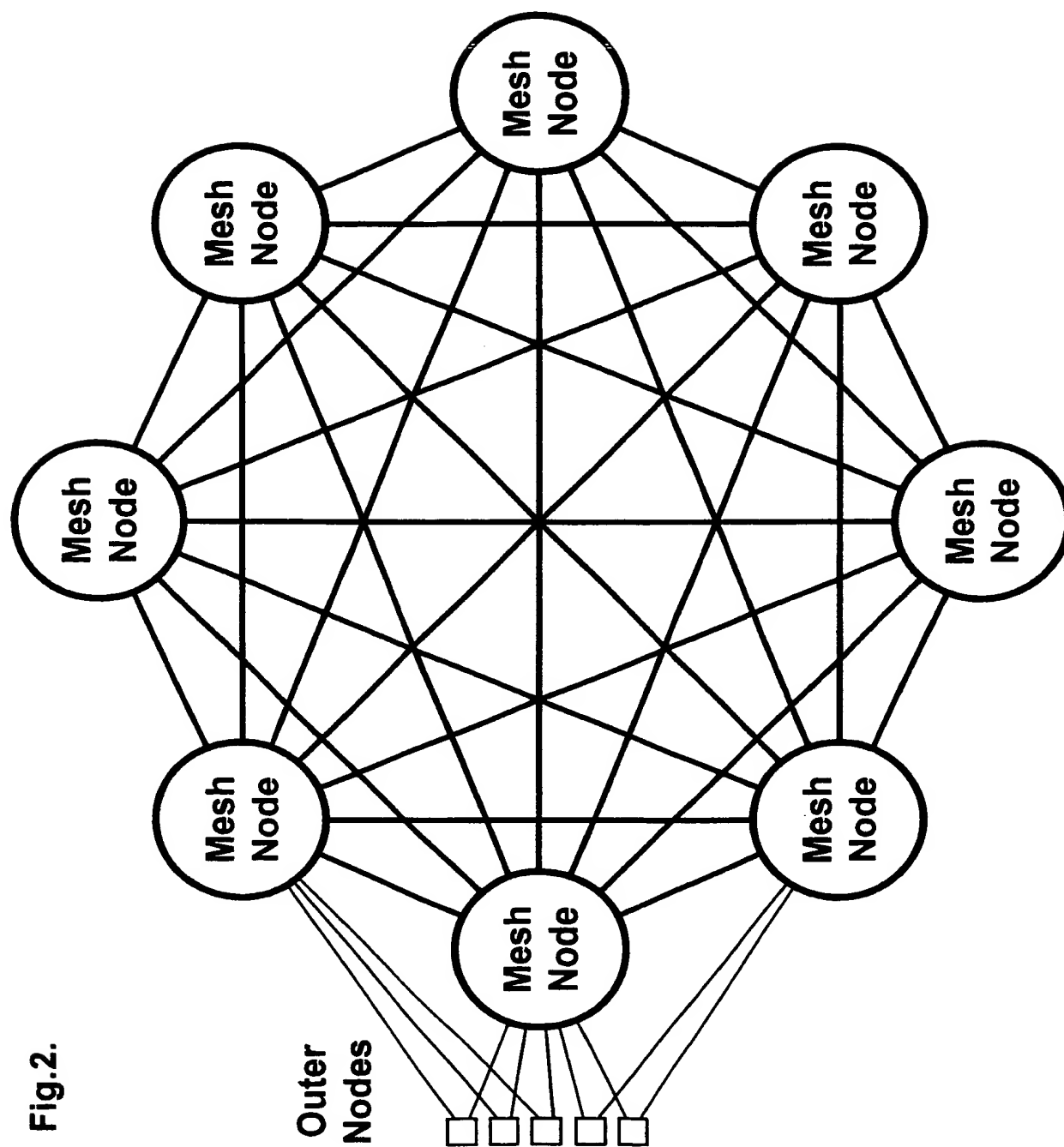


Fig.1.

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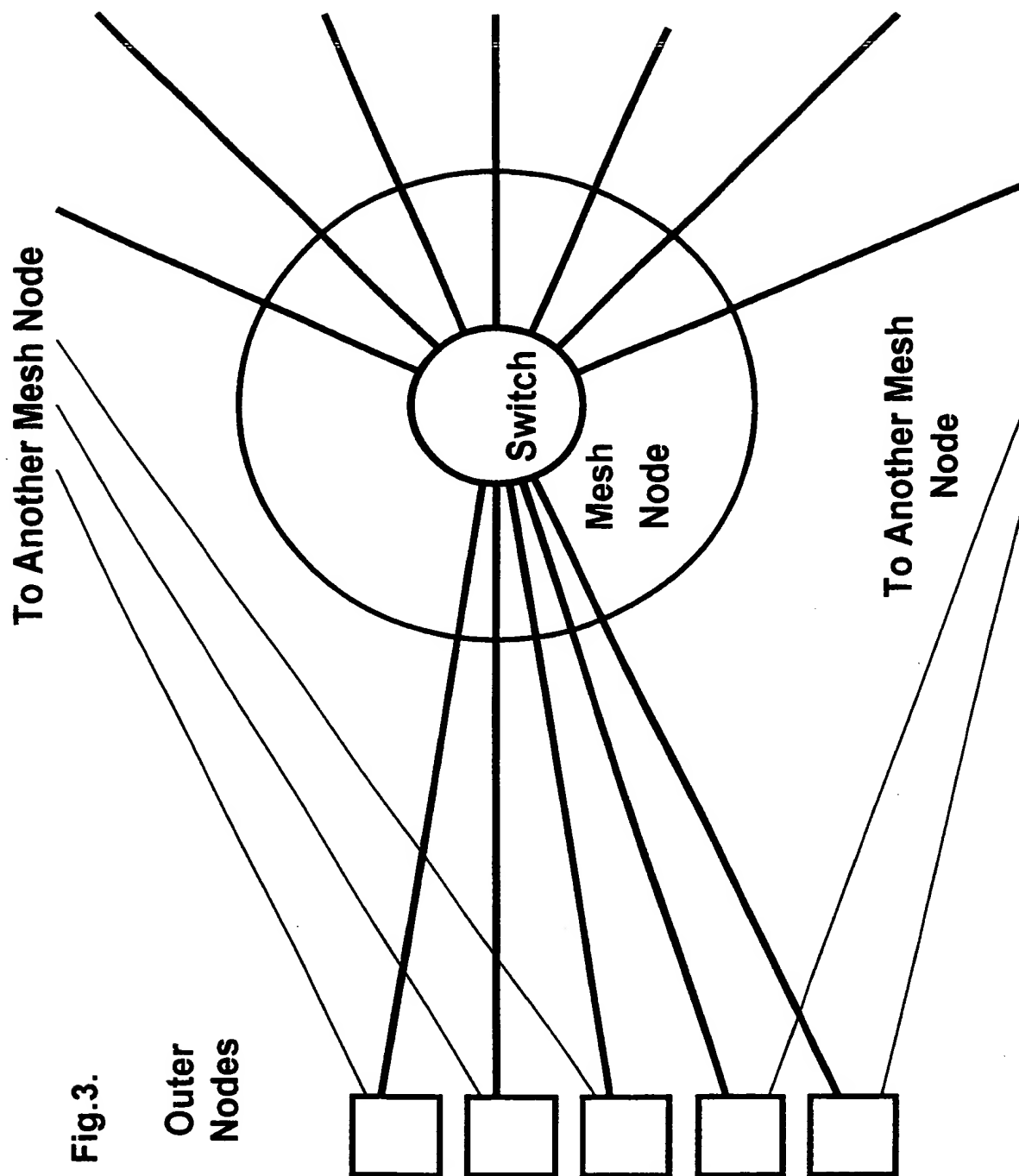


Fig.3.

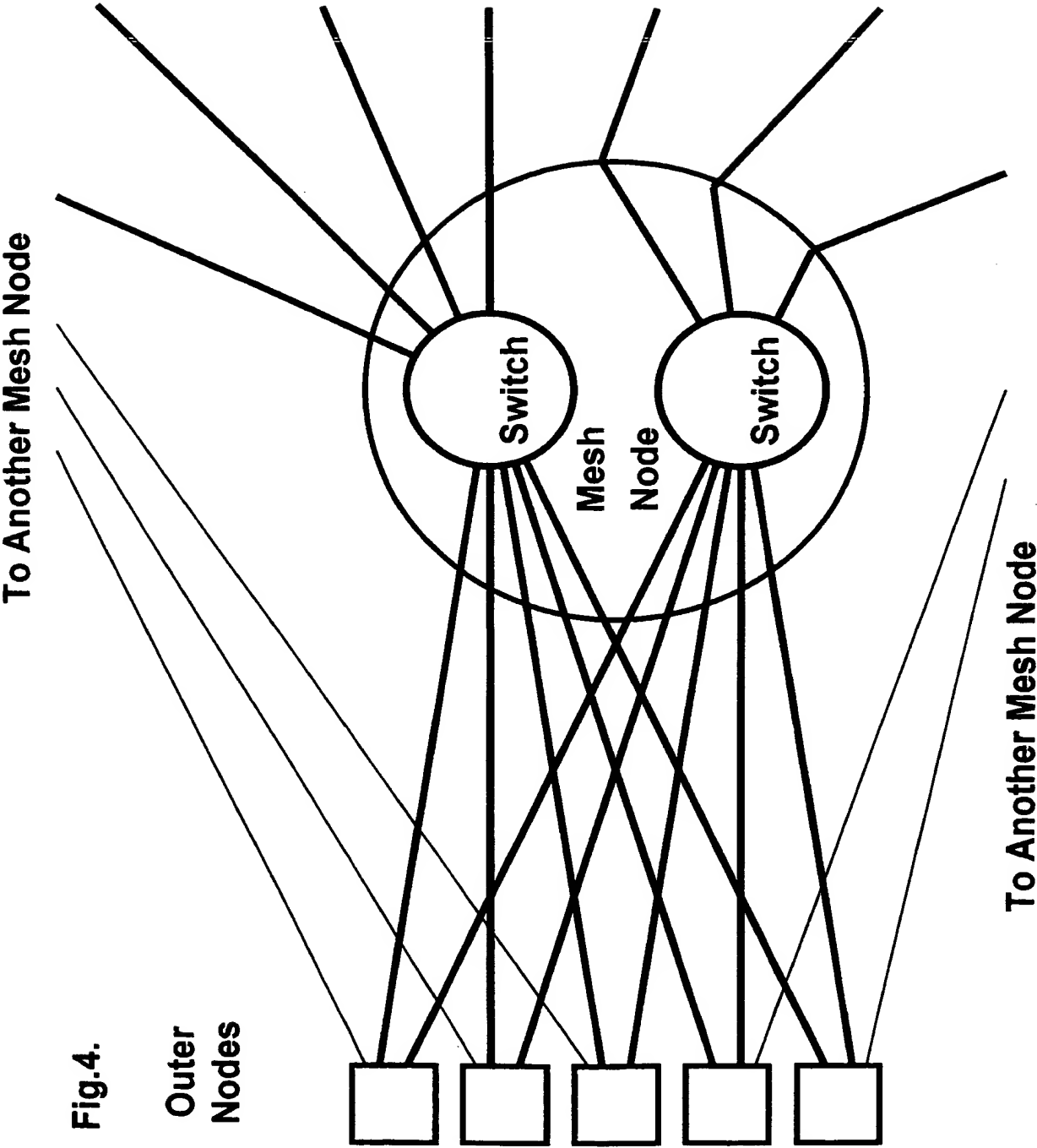
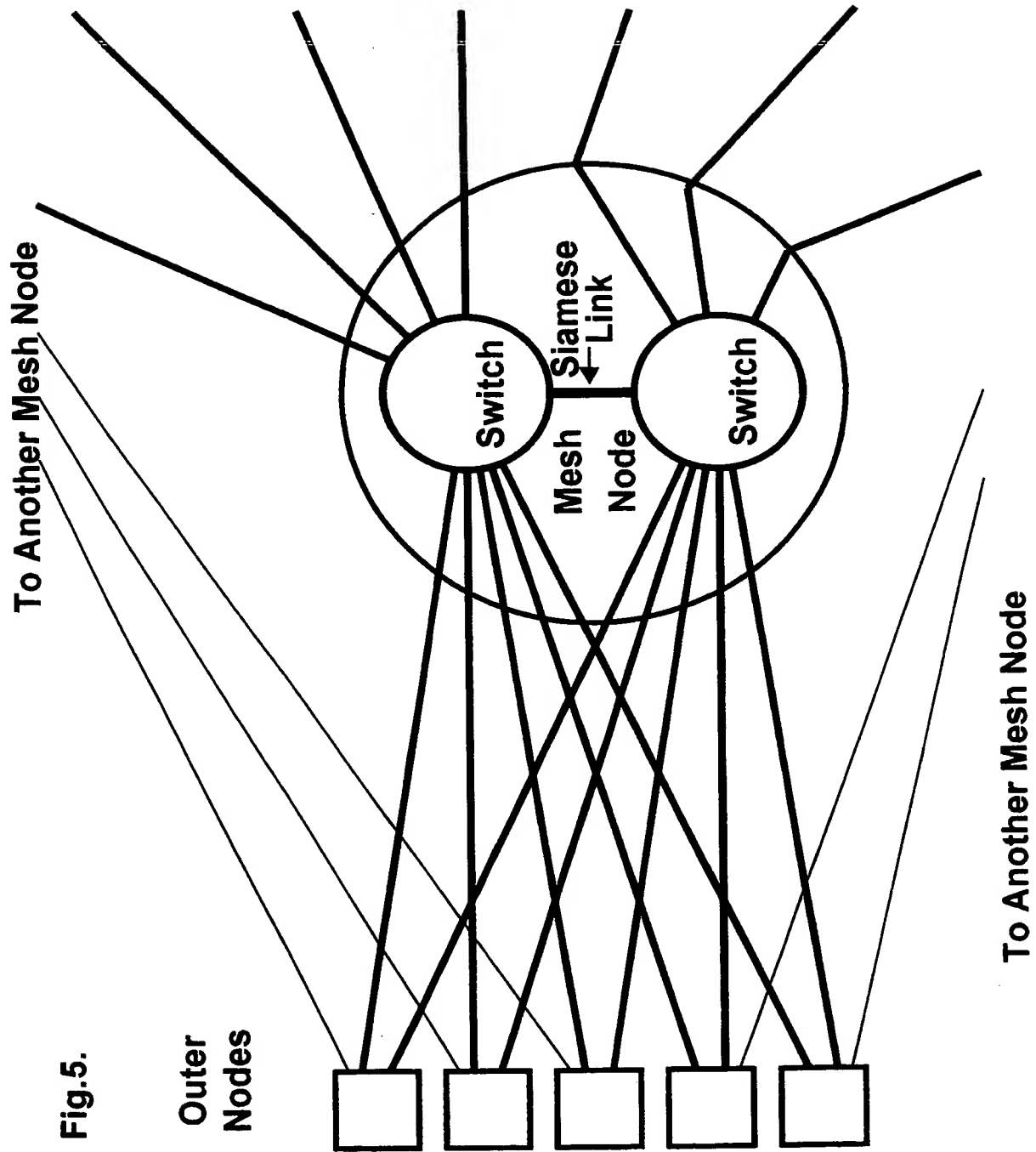


Fig.4.

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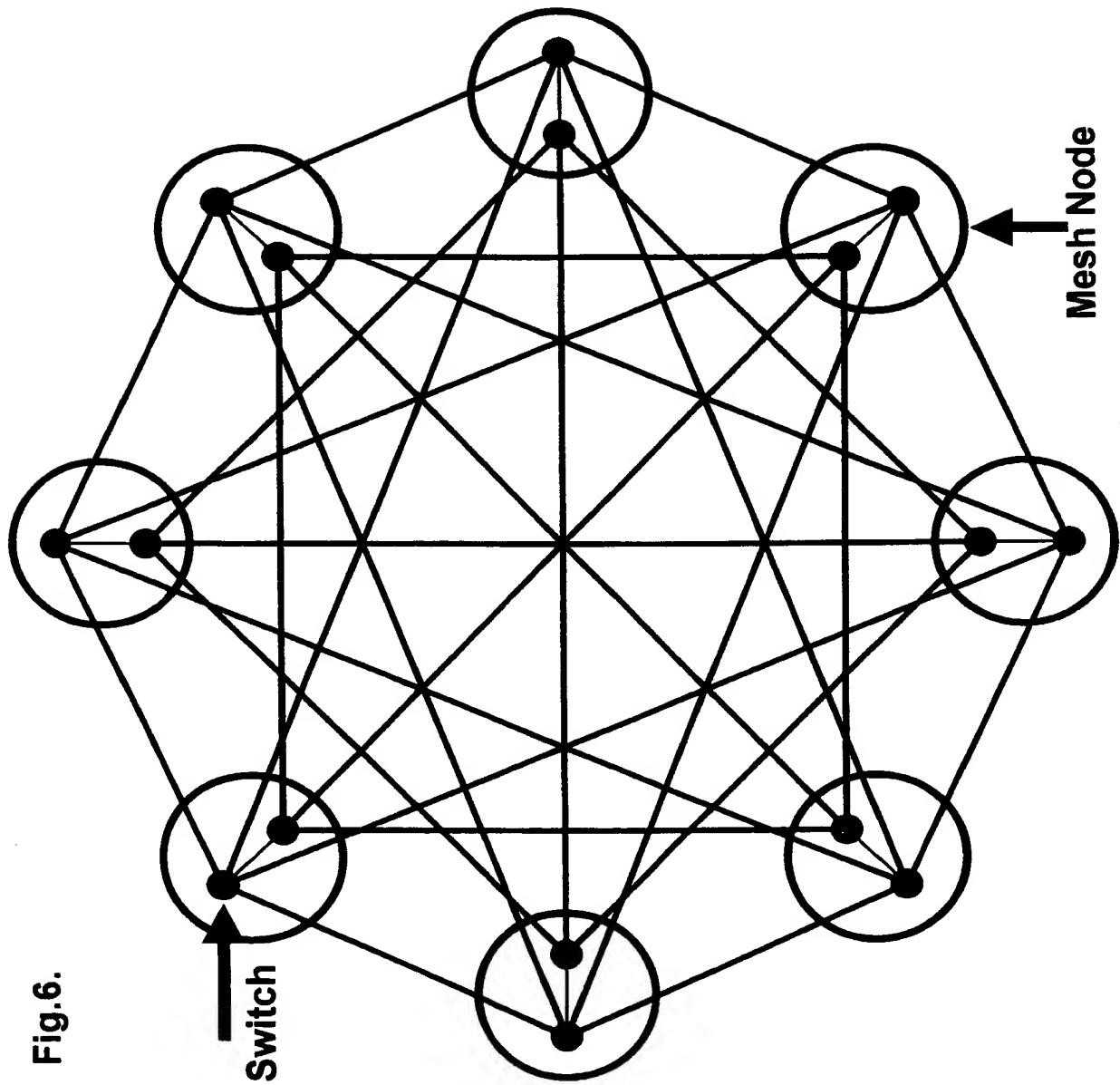


Fig.6.

INTERNATIONAL SEARCH REPORT

Int'l Application No

PCT/GB 00/02237

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04Q3/00 H04L12/56 H04Q3/68 H04L12/437

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04Q H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, IBM-TDB, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 851 693 A (LUCENT TECHNOLOGIES INC ;AT & T CORP (US)) 1 July 1998 (1998-07-01) abstract column 1, line 43 -column 3, line 48 claims 1-3 figures 2,5	1-5
A	US 4 853 927 A (WENZEL ROBERT) 1 August 1989 (1989-08-01) abstract figures 3,4 claim 1 column 2, line 57 -column 3, line 36 column 4, line 28-46 --- -/-	1-5

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

30 October 2000

Date of mailing of the international search report

07/11/2000

Name and mailing address of the ISA

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Cichra, M

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/02237

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 535 195 A (LEE WHAY C) 9 July 1996 (1996-07-09) abstract figures 2,3,5,9,14 claims 1,4,6 column 2, line 40-3 -column 3, line 13 column 5, line 50 -column 6, line 19	1-5
A	WO 98 31159 A (AT & T CORP) 16 July 1998 (1998-07-16) abstract figures 7,8 claims 1,2,13,14 page 6, line 26 -page 7, line 25	1-5

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/02237

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